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A comparison of the behavioral effects of ketamine and propofol sedation in the pediatric endoscopy unit

Summary

Introduction: Hospitalization and anesthesia can have a harmful psychological impact on children, leading to behavioral abnormalities. Using the Post Hospitalization Behavior Questionnaire for Ambulatory Surgery (PHBQ-AS) version of the Post Hospitalization Behavior Questionnaire for daycase patients, the objective of this study is to assess the differences between ketamine and propofol and propofol alone use following anesthesia.

Materials and methods: After receiving approval from the ethics committee, 84 children ages 2 to 18 who would undergo sedation surgery at the pediatric endoscopy-colonoscopy unit at Ankara City Hospital were enrolled in the study. Group K consisted of 27 patients sedated with ketamine and propofol, while group P consisted of 57 children sedated with propofol. To detect postoperative behavioral alterations in these youngsters, a questionnaire (POBQ-AS) was administered soon prior to the procedure and on the third day following it.

Results: Pre-procedural Behavior Assessment Questionnaire Total scores were comparable for both groups. The measures on the third day following the surgery were also comparable. The Post-procedure Behavior Evaluation Questionnaire Total Score increased significantly (p 0.05) in both groups compared to the pre-procedure score. In Group K, the answers to the questions "Is he disconnected to his environment?" and "Does he become depressed when left alone?" increased significantly more than in the other group (p 0.05).

Conclusion: Pediatric perioperative behavioral problem may be common. On the third postoperative day, sedative applications involving ketamine and propofol induce detrimental behavioral alterations, according to this study. In our patient group selected from the endoscopy unit to exclude factors such as mask induction, muscle relaxants, inhalation anesthetics, and surgical incision pain, we believe that only the negative behavioral changes of the intravenous anesthetics ketamine and propofol, as well as factors such as inflammation, surgical stress, and neurotoxicity, should be the focus of future research.

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Introduction

After hospitalization, children frequently exhibit altered behaviors, which may include increased anxiety, bedwetting, and nightmares.[1] Even after day surgery and day anesthesia, persistent introversion can develop. One month following surgery, 32% of children exhibited persistently unfavorable behavioral changes.[2]

There is evidence that certain anesthetic procedures utilized during surgery can promote postoperative introversion and depression. These negative behavioral alterations might be observed during induction of anesthesia, recovery, and following discharge. Changes in behavior resulting from anesthetic procedures can be complex and multivariate.[3-5] However, the majority of research have concentrated on alterations during induction and waking. During endoscopy and colonoscopy procedures conducted on a daily basis, intravenous anesthetics are used to induce sedation. In general, midazolam, fentanyl, propofol, and ketamine are favored. Since the patient does not experience surgical tension and incision pain, it is not necessary to administer a deep anesthetic.

Ketamine is a suspect drug for causing unfavorable postoperative behavior changes as a result of nightmares and terrible dreams. By comparing the effects of using propofol and ketamine separately, this study investigated this suspicion. In this study, we wanted to compare the behavioral effects of ketamine and propofol, eliminating the effects of mask induction, muscle relaxants, inhalation anesthetics, airway procedures, surgical stress, and postoperative pain.

Materials and methods

This prospective, double-blind study was undertaken by administering a questionnaire to the families of children who received sedation at the pediatric endoscopic colonoscopy unit of Ankara Bilkent City Hospital, with the approval of the hospital's local ethics council. The POBQ (post hospitalization behavior questionnaire) is a revised variant (ambulatory surgery-AS) of a valuable scale known as the post hospitalization behavior questionnaire for outpatients. Patients were included in the trial after receiving informed permission. Included in the trial were children who received outpatient endoscopy and colonoscopy procedures in the pediatric endoscopy unit within six months of the study's initiation. In this study, 84 patients with ASA1-2 who will get sedation anesthesia were enrolled. The study excluded patients with concurrent psychiatric or neurologic illness. Excluded from the study were patients who required anesthetic techniques other than sedation, as well as intubation. After all patients received intravenous midazolam and fentanyl for sedative premedication, 2-4 lt/min of oxygen was supplied via nasal oxygen cannula. Those administered ketamine and propofol were separated into group K (n=27) and those given only propofol were separated into group P (n=57) after seeding. No analgesics were administered following the surgery.

Patients' demographic information, ASA scores, medicines utilized and their dosages, as well as the length of the surgery, were recorded. Before the procedure, the nurse in the preoperative waiting area

completed the questionnaire supplied to the family, and on the third postoperative day, the researchers completed the same questionnaire over the phone.

Used with permission from Brooke. This newly designed scale provides a tool to alleviate the burden of postoperative behavioral assessment by reducing administration time, eliminating additional items, and enhancing the scale's applicability in an outpatient surgical context. Responds to questions by examining the behavior of their own children. They evaluate behavioral changes in hospitalized youngsters. Eleven questions assess maladaptive behaviors such as tantrums, lethargy, hunger loss, and sleep difficulties, as well as behavioral regression. It is the 27-question abridged version of the POBQ (post hospitalization behavior questionnaire) that was originally designed for outpatients.[6,7] Much less than before (1 point), less than before (2 points), as before (3 points), more than before (4 points), and much more than before (5 points) are the possible responses for each question. It has been demonstrated that the POBQ questionnaire is valid for measuring behavioral changes in hospitalized children, and the POBQ-AS has a validity rate of 80%.[7-9]

Mean, standard deviation, median minimum, maximum, frequency, and ratio values were utilized in the descriptive statistics of the data. Since an increase in postoperative adverse behavior may occur in more than half of patients receiving propofol or propofol and ketamine, the power analysis (alpha=0.005 and B=0.8) indicated that at least 25 patients in each group were required to demonstrate the 3rd day behaviors developed in similar proportions of patients. Using the Kolmogorov-Smirnov test, the distribution of variables was determined. The t-test and mann-whitney u-test were employed to analyze quantitative independent data samples. The Wilcoxon test was utilized to analyze dependent quantitative data. In the analysis of qualitative independent data, the Chi-square and Fischer tests were applied. A P value less than 0.05 was deemed significant. SPSS 28.0 was utilized for the analysis.

Results

There was no difference between the groups in terms of demographic information or ASA scores ($p > 0.05$). Significantly (p 0.05) more propofol was measured in the group using ketamine than in the group not using ketamine. There was no difference ($p > 0.05$) between the amounts of midazolam and fentanyl utilized. The duration of the surgery was considerably (p 0.05) longer in the ketamine group than in the control group. Significantly (p 0.05) more colonoscopies were performed in the group using ketamine than in the group not using ketamine. Before and after the surgery, the POBQ-AS Total Score did not differ significantly between group K and group P ($p > 0.05$). Post-procedure POBQ-AS Total Score increased significantly (p 0.05) in both groups relative to pre-procedure levels (Table 1).

The questions "Is he unrelated to his environment?" and "Does he become distressed when left alone?" were considerably higher (p 0.05) in group P than in group S. In response to other questions, there was no significant difference ($p > 0.05$) between the ketamine-using and ketamine-free groups before and after the surgery (Table 2).

Table 1 Demographic data and evaluation of some variables

		Group P n=57			Group K n=27			p	
		mean±sd/n-%	Medyan		mean±sd/n-%	Median			
Age		13.0 ± 4.6	15.0		11.5 ± 5.1	12.5		0.213	m
Gender	Female	48 82.8%			18 69.2%			0.162	X^2
	Male	10 17.2%			8 30.8%				
lenght		149.8 ± 24.8	159.0		140.8 ± 36.0	156.0		0.521	m
weight		47.9 ± 21.2	48.0		46.5 ± 26.8	44.0		0.526	m
BMI		1291.7 ± 1641.9	680.0		1435.2 ± 1614.6	724.3		0.552	m
ASA	I	53 91.4%			22 84.6%			0.354	X^2
	II	5 8.6%			4 15.4%				
Propofol (mg)		114.9 ± 43.4	120.0		162.1 ± 91.3	177.5		***0.018***	m
Midazolam (mg)		1.39 ± 0.27	1.50		1.33 ± 0.32	1.50		0.462	m
Fentanyl		51.4 ± 20.5	50.0		45.4 ± 19.7	50.0		0.231	m
Operation duration		10.3 ± 4.6	8.0		43.0 ± 20.2	45.0		***0.000***	m
method									
endoscopy		56 96.6%			6 23.1%				
colonoscopy		1 1.7%			18 69.2%			***0.000***	X^2
both		1 1.7%			2 7.7%				
Behavior Evaluation Questionnaire Total Score									
Before Operation		22.7 ± 8.1	22.5		24.2 ± 6.3	24.0		0.282	m
Post-Processing		33.9 ± 2.2	33.0		34.6 ± 2.4	33.0		0.459	m
With in Group Change p		***0.000***	w		***0.000***	w			

t test / m Mann-whitney u test / X^2 chi-square test / w Wilcoxon test

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Table 2 Evaluation of the survey questions

	Group P		Group K		p	
	mean±sd	Median	mean±sd	Median		
Does your child make a fuss about eating?						
Berfore	2.4 ± 1.6	2.0	2.2 ± 1.4	2.0	0.890	m
After	3.2 ± 0.4	3.0	3.2 ± 0.4	3.0	0.878	m
Does your child spend time just sitting or lying and doing nothing?						
Berfore	2.2 ± 1.4	2.0	2.0 ± 1.2	1.0	0.504	m
After	3.0 ± 0.4	3.0	3.1 ± 0.3	3.0	0.438	m
Is your child uninterested in what goes on around him (or her)?						
Berfore	1.9 ± 1.1	1.0	2.0 ± 1.3	1.0	0.770	m
After	3.0 ± 0.3	3.0	3.2 ± 0.4	3.0	***0.008***	m
Does your child get upset when you leave him (or her) alone for a few minutes?						
Berfore	2.3 ± 1.4	2.0	2.1 ± 1.3	2.0	0.623	m
After	3.1 ± 0.5	3.0	3.2 ± 0.4	3.0	***0.044***	m
Does your child need a lot of help doing things?						
Berfore	1.9 ± 1.0	1.0	2.0 ± 1.2	2.0	0.595	m
After	3.0 ± 0.3	3.0	3.1 ± 0.3	3.0	0.124	m
Is it difficult to get your child interested in doing things (like playing games with toys)?						
Berfore	1.8 ± 1.0	1.0	1.8 ± 0.9	2.0	0.942	m
After	3.0 ± 0.3	3.0	3.1 ± 0.3	3.0	0.502	m
Does your child have temper tantrums?						
Berfore	2.2 ± 1.4	1.5	2.6 ± 1.4	3.0	0.246	m
After	3.1 ± 0.3	3.0	3.0 ± 0.0	3.0	0.241	m
Is it difficult to get your child to talk to you?						
Berfore	2.1 ± 1.1	2.0	2.7 ± 1.5	3.0	0.052	m
After	3.1 ± 0.3	3.0	3.2 ± 0.4	3.0	0.512	m
Does your child have bad dreams at night or wake up and cry?						
Berfore	1.5 ± 1.0	1.0	2.0 ± 1.0	2.0	0.058	m
After	3.2 ± 0.5	3.0	3.1 ± 0.3	3.0	0.904	m
Does your child have trouble getting to sleep at night?						
Berfore	1.6 ± 1.0	1.0	2.0 ± 1.1	2.0	0.072	m
After	3.1 ± 0.4	3.0	3.3 ± 0.5	3.0	0.104	m
Does your child have a poor appetite?						
Berfore	2.8 ± 1.7	3.0	2.7 ± 1.4	2.5	1.000	m
After	3.1 ± 0.4	3.0	3.1 ± 0.6	3.0	0.705	m

[m]Mann-whitney u test

Discussion

After anesthesia and surgery, children may display alterations in behavior. Changes in eating, sleeping, anger management, and anxiety have been observed in the postoperative period. A tiny fraction of these alterations may be lasting for more than a year, which may have an impact on school and family life.[8] Consequently, it is vital to monitor behavioral changes and better comprehend the etiology, incidence, and treatment response. This study demonstrated that the use of ketamine and propofol for sedation in outpatient anesthesia led to an increase in unfavorable postoperative behaviors.[10]

The formulation of the questionnaire utilized in the study was effective for measuring the behavior of daily instances. The POBQ was a 27-item questionnaire created by Vernon et al. in 1966, based on several research describing behavioral abnormalities in hospitalized children.[7] For the past six decades, it has served as the gold standard in this study field. Brooke et al. developed the POBQ-AS questionnaire in 2015 by lowering the number of questions in their database of 1064 patients and reducing the number of questions to 11 to make it suitable for outpatients.[6] It has been noted that the updated version of the questionnaire is reliable and consistent. (0.80 for Cronbach's alpha) They obtained results correlating with the

functional disability inventory. In a subsequent investigation with 248 pediatric patients, Cronbach's alpha was determined to be 0.79 and Spearman's correction was determined to be 0.85.[11] It is intended for general evaluations of the child's emotional, behavioral, and social problems, as well as post-anesthesia issues. We chose the POBQ-AS questionnaire to examine the behavioral effects of propofol and propofol with ketamine in a sample of outpatients who did not receive inhalation anesthesia and muscle relaxants.

Publications indicate that the incidence of unfavorable behavior changes in children following hospitalization and surgery ranges from 22 to 92%.

In various investigations, Kain et al. found an incidence of 23-53% after anesthesia.[8,12] However, Tuomilehto et al. discovered just 1% to 5% following adenoidectomy surgery. These distinctions demonstrate that detrimental behavioral changes during hospitalization are influenced by numerous circumstances. When split by age, the younger age group exhibits more behavioral changes than the older age group. Furthermore, it has been found that different cultures may have biases that influence the outcomes. It has been stressed that postoperative discomfort can result in bad postoperative conduct. In this study, however, we tended to be more selective in the two age-matched groups, as there was no surgical incision pain and the procedure was conducted on individuals of the same culture. Although preoperative anxiety is also implicated in the development of postoperative behavioral disorder, future study may focus on other factors that may be equally relevant, such as inflammation, surgical stress, pain, and neurotoxicity.

There is no unanimity regarding which behavior changes following anesthesia in children increase and which characteristics are influenced by the child or family. A distressing experience as a child increases the likelihood that future health care encounters will be met with anxiety, induce fear and anxiety, and decrease adherence to medical treatment.[13-16] Even the mildest sedation techniques demonstrated in this study should be modified to include negative behavioral changes, preoperative exhortation, greater doses of anterograde amnesia drugs, and beginning the treatment without leaving the family.

The potential neurotoxicity of general anesthetic medications may coincide with the maturation of the body, cognitive deterioration following surgery, and adult delirium. In this investigation, there was no difference between the administration of propofol and ketamine+propofol in terms of postoperative unfavorable behavioral alterations. However, studies on cognitive deterioration can be conducted with longer periodic controls. After the operation, it was noticed that scores increased in both groups. Historically, ketamine has been linked to postoperative anxiety and agitation. Ketamine, midazolam, and opioid sedation administered for fracture reduction in the emergency department have been reported to increase negative conduct by 18% after discharge. This was observed to connect with pre-anesthesia anxiety levels. In our study, the worsening in both questions was greater among ketamine users.

unfavorable alterations in behavior Using this questionnaire, large randomized controlled studies should show the impact of outcome-influencing factors, anaesthetic types and other anesthetic medicines, inflammation, and genetics in the pediatric population.

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None.

Conflicts of interest

None.

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